

# ***Preliminary Inventory of Ocean Resource Science Coordination Efforts in California***

## **Draft Report**

**Prepared pursuant to  
Public Resources Code Section 36980  
(California Ocean Resources Stewardship Act of 2001)**

**Mary D. Nichols, Secretary  
California Resources Agency**

**Governor Gray Davis  
State of California**



**December 2002**

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Ocean Resource Science  
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## **I. INTRODUCTION**

Pursuant to Section 36980 of the Public Resources Code, the Secretary of the Resources Agency is required to report to the Legislature on "...the steps being taken to ensure adequate coordination of ocean resources management science among state, regional, and federal agencies and marine science institutions." The purposes of this coordination are to provide adequate information to marine science institutions about the information needs of agencies and to maximize the usefulness of ongoing and proposed ocean science projects to ocean resource management agencies.

This preliminary report identifies a variety of high quality ocean research and monitoring activities that are being conducted throughout California at the national, state, regional, and local levels. However, there is currently no mechanism in place to inventory, coordinate, or link these many activities on a systematic, statewide basis. This coordination is a major goal of the California Ocean Resources Stewardship Act (Stewardship Act; AB 2387 Keeley; Chapter 516, stats. 2000). The Stewardship Act provides a mechanism to identify California's highest research and monitoring priorities that will support management issues facing the state. The Stewardship Act also authorizes the Secretary for Resources to establish a trust to help identify those needs and to coordinate and fund efforts to maximize the utility of investments made by government, academia, the private sector, and public service groups. In a world with shrinking budgets and expanding management challenges, the time for establishing such a trust has arrived.

This report includes a preliminary identification of the major organizations and ongoing efforts to coordinate ocean resource management science in California. It is beyond the scope of this report to capture all of the activities that are currently taking place. We anticipate the publication of a more comprehensive report in the future, based on future analysis and the comments received on this first effort.

### **Background**

The majority of California's population lives and works within 50 miles of the state's 1,100 miles of coastline. The Pacific Ocean and adjacent lands represent national and international treasures that should be protected and managed for their biological productivity, resource diversity, and aesthetic beauty. These habitats are facing increasing pressures from development and pollution, the future effects of which are not completely understood.

Economic data from 1992 indicates that nine ocean-dependent industries contributed \$17.3 billion in wages and income that year to the state's economy. Absent the use of multipliers, that contribution would be about \$10 million, or roughly the equivalent of California agricultural production that year. Anyone who questions the economic importance of the coast needs only to look at the economic impacts of large oil spills, beach closures, or the recent shutdown of west coast ports. The Resources Agency is currently funding an updated assessment of these economic values through the National Ocean Economics Project. However, existing information indicates that California's ocean and coastal resources play a

critical role in the health of our ecosystem, our quality of life, and the vitality of the state's economy.

The effective management of our ocean and coastal resources should be based on sound science and a greater understanding of changes to the environment resulting from human activities, as well as changes resulting from natural processes. California has a large community of outstanding public and private research organizations and institutions that have increased their commitments to studying ocean and coastal resources. Obstacles to collaborative efforts include inadequate coordination among marine science institutions, inadequate coordination with and among management agencies about information needs, unknowing duplication of efforts, and a lack of standardized and coordinated information management techniques.

It has become increasingly clear that we need to facilitate and maintain the linkage between the research community, policy makers, and resource managers. Recent efforts to improve this linkage have led to ocean and coastal research that is more focused on addressing pressing management issues such as habitat and water quality degradation, shoreline erosion, and the decline in the abundance of marine resources.

## **II. STATE EFFORTS**

### **Ocean Science Trust**

The Stewardship Act authorizes the Secretary for Resources to form a California ocean trust, to be named the California Ocean Science Trust (Trust). This Trust will operate, in cooperation with the National Fish and Wildlife Foundation, to fund and develop new funding sources for marine research in California that help to fulfill the missions of the state's ocean resource management agencies. The Trust will also encourage coordinated, multi-agency, and multi-institution approaches to ocean resource science; encourage new technologies that reduce the cost, increase the amount, or improve the quality of ocean resource management information; and encourage ocean resource management graduate education programs in public and private universities and colleges. The Trust will provide a unique opportunity to combine public resources with those from the private sector and nonprofit organizations to promote new marine research, education, and management approaches within California.

Pursuant to the Stewardship Act the Trust will consist of ten members, including one appointee of the Secretary for Environmental Protection and one appointee of the Director of Finance. The remaining eight trustees are designated by and serve at the pleasure of the Secretary for Resources:

- one member representing the Resources Agency,
- three members nominated jointly by the President of the University of California and Chancellor of the California State University,
- two members nominated by ocean and coastal interest groups, and
- two members who will represent the general public.

The first full meeting of the Trust is scheduled for late January 2003. Trustees will develop research priorities combined with strategies to develop funding from national, state, nonprofit, and private sources. The Trust will work to fund research efforts that are coordinated among academia, industry, government agencies, and public interest groups. The Trust's initial funding of \$850,000 will come from the federally funded Coastal Impact Assistance Program. Of this amount, \$100,000 has been set aside to fund staff and logistical support for the first two years of the Trust's operation and the remaining \$750,000 will go directly to support research projects.

The Trust is required to report annually on its activities to the legislature and the Chair of the Joint Committee on Fisheries and Aquaculture. It is anticipated that the annual report will include an update to the information provided in this preliminary research coordination report.

### **California Ocean Resources Management Program**

The California Ocean Resources Management Program (Ocean Program) has undertaken a variety of activities to help coordinate ocean and coastal marine research activities at both the state and federal level. Listed below are some of the activities involving the Ocean Program that will compliment the actions of the Trust:

*Resources Agency Sea Grant Advisory Panel (RASGAP).* The Secretary for Resources chairs the RASGAP, which was established by Section 6230 of the Public Resources Code. This panel, consisting of representatives from state agencies, academia, industry, and the legislature, establishes research priorities for state matching funds for California Sea Grant projects and makes recommendations to the Secretary for Resources regarding appropriate projects to fund. This panel is key to helping ensure that state funds used for Sea Grant research are directed toward high priority, management-oriented, marine research initiatives. (The National and California Sea Grant programs are discussed in greater detail in Section III of this report).

*National Sea Grant Extension Review Panel.* The California Ocean Program Manager participated on the National Sea Grant Extension Review Panel to evaluate the merits of the National Sea Grant Extension Program. This resulted in the document, "*A Mandate to Engage Coastal Users – A Review of the National Sea Grant College Extension Program and A Call for Greater National Commitment to Engagement.*" This document, which explores ways to improve the linkage between Sea Grant science and management, has been widely circulated and formally submitted to both the Pew and U.S. Ocean Commissions for their consideration in evaluating national ocean policy.

*Heinz Center Coasts and Oceans Workgroup.* The H. John Heinz III Center for Science, Economics and the Environment, is completing work on a document, "*Measuring the Lands, Waters, and Living Marine Resources of the United States,*" to describe and report on the state of major ecosystems and to report on key indicators. The Ocean Program participated in this effort. It is relevant to coordination of research activities because it documents the state of knowledge of national ocean and coastal systems and will help

drive future research and monitoring directions in California and other coastal areas throughout the United States.

*Coastal Sediment Management Workgroup.* This group, co-chaired by the California Resources Agency and U.S. Army Corps of Engineers, is helping to coordinate planning, management, and science endeavors for developing a Coastal Sediment Management Master Plan for the entire California coast. This coordination will be critical to driving future research and monitoring needs related to coastal sediment management in California for years to come. It will address such issues as beaches, wetlands, watersheds, and flood control.

## **State Interagency Research and Management Programs**

The following are two examples of programs that deal with cooperative research, assessment and management of resources in nearshore, coastal, and/or bay/delta environments. They are provided as examples of programs where the coordination, evaluation and application of research and monitoring results is essential.

*Cooperative Research and Assessment of Nearshore Ecosystems.* To effectively manage nearshore fish, the State of California and other interested parties must acquire and coordinate new information on the status of fishery stocks. In particular, it is necessary to determine how many fish there are, how many fish are being added by recruitment, and how many are being removed by mortality, including fishing mortality. It is also important to determine if the population is increasing or decreasing over time. The Department of Fish and Game has programs that provide information on the number of nearshore fish taken by commercial and recreational fishers, but previously no statewide program has been in place to comprehensively assess and coordinate data regarding the status of nearshore fish populations. To fill this gap, the department has convened the Cooperative Research and Assessment of Nearshore Ecosystems (CRANE) to design and implement a sampling program that will provide information that can be used to manage nearshore fish and invertebrate populations, as well as to evaluate the status of nearshore rocky reef ecosystems.

The membership of CRANE includes representatives from state agencies, universities, the federal government, and both non-profit and private sector organizations. CRANE will function under cooperative agreements with these partners to provide resources (e.g., personnel, boats and crews) for the core of the sampling program. In addition, CRANE will use money from the California Impact Assistance Program (CIAP) to supplement the existing resources. The objective is to validate research techniques in 2002 and conduct a full-scale survey in 2003.

*CALFED Bay-Delta Program.* The mission of the CALFED Bay-Delta Program is to develop and implement a long-term comprehensive plan that will restore ecological health and improve water quality management for beneficial uses of the San Francisco Bay-Delta Estuary. The program is a cooperative effort of more than 20 state and federal agencies working with local communities. A key challenge for the CALFED program is

coordinating research and monitoring data necessary to support implementation of the program.

To achieve its mission, CALFED seeks to integrate world-class science and peer review into every aspect of the program. CALFED is developing the best scientific information possible to guide decisions and evaluate future actions. The scientific goals of the program are:

- To establish a body of knowledge that is unbiased, relevant, authoritative and integrated, while communicating that knowledge to the scientific community, agency managers, stakeholders and the public
- Establish protocols and incorporate independent peer review into all program activities
- Develop science-based performance measures for each CALFED program.

### **State Interagency Monitoring Programs**

A number of state-driven, interagency monitoring programs are highly dependent upon coordination between departments within the Resources Agency, the California Environmental Protection Agency (Cal/EPA), the California Department of Health Services, and other entities.

*Toxic Substances Monitoring Program (TSMP).* The State Water Resources Control Board (SWRCB), the regional water quality control boards (RWQCBs) and the Office of Environmental and Health Hazard Assessment require data for human health assessments and advisories. TSMP was initiated in 1976 by SWRCB to provide a uniform statewide approach to the detection and evaluation of the occurrence of toxic substances in fresh, estuarine, and marine waters of the state through the analysis of fish and other aquatic life. TSMP primarily targets water bodies with known or suspected impaired water quality and is not intended to give an overall water quality assessment. The California Department of Fish and Game (DFG) carries out the statewide TSMP for SWRCB by collecting and analyzing samples. SWRCB provides funding for the program under an ongoing interagency agreement with DFG, while sampling stations are selected primarily by the nine RWQCB's.

*Mussel Watch.* California's Mussel Watch program has operated since 1977 under the authority of SWRCB. Tests are performed under contract with DFG. Designed to measure inorganic contaminants in coastal waters, the basic Mussel Watch procedure samples mussels at 150 stations statewide each January, testing for inorganic toxins. Routine tests are conducted for more than 50 different chemicals, including toxic heavy metals, chlorinated pesticides, and hydrocarbons. In addition to routine testing, special studies are conducted at specific sites, such as the Diablo nuclear power plant.

*Shellfish Sanitation Program.* The Environmental Management Branch of the California Department of Health Services (DHS) certifies and regulates shellfish growing areas

according to standards mandated by the National Shellfish Sanitation Program. All harvesters and growers of bivalve shellfish (e.g. oysters, clams, mussels) must obtain a certificate from DHS prior to harvest. The Environmental Management Branch monitors state waters, testing for the presence of biotoxins occasionally found in natural "blooms" of marine algae. Biotoxins assimilated in bivalve shellfish can cause illness such as paralytic shellfish poisoning. California's 6 commercial shellfish growing areas are tested weekly for marine biotoxins and a total of 24 other sampling stations statewide are tested for biotoxins up to 18 times each year. California officials, the U.S. Food and Drug Administration, and the U.S. Department of Commerce are developing an expanded, coordinated plan to address natural toxins in seafood. California fishermen are cooperating with state and federal officials to expand knowledge of marine biotoxins and their effects on California's seafood supply.

### **Other State Efforts – Integrated Research and Monitoring**

This report includes many research or monitoring efforts where the state is either a lead or a participant with a variety of other institutions, organizations, or interested parties. These efforts include state participation or leadership with operations such as the National Sea Grant Program, National Estuarine Research Reserves, National Estuary Program, Southern California Coastal Water Research Project, Southern California Wetlands Recovery Project, and California Cooperative Oceanic Fisheries Investigations. Although these are not purely state research efforts, few are. The fact is that most research and monitoring, and their coordination, is by necessity through organizations that include a host of participants. It is beyond the scope of this report to capture all of the activities that are currently taking place.

### **California and the World Ocean**

There are many conferences and special events held in California and other locations throughout the United States that include the subject of coordinating research and monitoring activities. This report could not even begin to identify them in a comprehensive manner. Instead, just one, *California and the World Ocean (CWO)*, is given as an example of a conference intended to facilitate a comprehensive look at California ocean and coastal policy and science. The first CWO conference was convened in 1964 by Governor Edmund G. Brown. In 1997 the California Resources Agency published a statewide strategy, *California's Ocean Resources: An Agenda for the Future*, that identified an array of approaches to resource stewardship and economic sustainability. To discuss the future implications of this document, the Agency organized a second conference (CWO '97) which gathered policy makers, scientists, and public interest groups to analyze the issues that face California's ocean and coast, and to discuss potential solutions that were rooted in sound science.

In October 2002, *California and the World Ocean '02* (organized by the Resources Agency, Cal/EPA, and the Coastal Zone Foundation) was held in Santa Barbara, California. This conference brought together a large, diverse audience to present science data and discuss the management issues that face California's ocean and coastline. The conference provided an opportunity to present new ideas and to coordinate the development of new

approaches based on the best science available. The Resources Agency plans use much of this information to update California's ocean strategy and to set new goals for marine management and research that will help guide conservation and development priorities for years to come.

### **III. NATIONAL EFFORTS**

#### **U.S. Commission on Ocean Policy and the Pew Oceans Commission**

At the national level the U.S. Commission on Ocean Policy and the Pew Oceans Commission are evaluating the national approach to ocean and coastal management and protection. Both commissions have held extensive public meetings in coastal states throughout the United States to seek advice on how the nation can improve its approach to managing and protecting ocean and coastal resources.

The U.S. Commission is currently assessing the existing body of knowledge related to ocean and coastal research, education, and marine operations to determine how to meet the national goals set forth in the Oceans Act of 2000 (P.L. 106-256). Of specific relevance to California's efforts to coordinate research activities will be the Commission's analysis of the relative roles of stakeholders (academia, government, industry and the public) in ocean and coastal science. The Commission's report is due to the President and Congress by June 20, 2003.

The Pew Oceans Commission is an independent group of American leaders conducting a national dialogue on the policies needed to restore and protect living marine resources in U.S. waters. After reviewing the best scientific information available and speaking with people from around the country, the Pew Oceans Commission will make its formal recommendations in a report to Congress and the nation early in 2003. These recommendations will most certainly address the most effective ways to approach our national ocean and coastal research questions and how best to coordinate those efforts.

The results of the investigations of both of these commissions will be important to the future coordination of ocean and coastal research in California. California should work to ensure that it both participates in, and is ready to adapt to, any restructuring of the national approach to ocean and coastal research.

#### **National Sea Grant College Program**

The National Sea Grant College Program (Sea Grant Program), created through the National Sea Grant College and Program Act of 1966 (as amended in 1976 and 1987), has established a unique network of ocean and coastal research and outreach partnerships among federal, state, and local governments, academic institutions, and the private sector. The Sea Grant Program provides federal funding to institutions in 29 states for improving the understanding of ocean resources and creating strategies for sustainable ocean resource development, management, and conservation. Each of the 29 states has one or two Sea Grant programs established pursuant to the federal legislation.

The Sea Grant programs in California include the California Sea Grant College Program, administered by the University of California, and the University of Southern California Sea Grant Institutional Program, administered by the University of Southern California (USC). They are the largest such programs in the nation and exist primarily as a funding source for scientists at their respective institutions, with monies provided through the National Atmospheric and Oceanic Administration and matching funds provided by the researchers' institutions, private sources and State of California. However, the California programs also support a variety of other activities including workshops, conferences, and symposia to help link research with management needs. Currently there are almost 40 active marine research projects funded by Sea Grant in California.

In addition to supporting individual researchers at state universities, the Sea Grant programs oversee the Sea Grant Marine Extension Program. The UC Sea Grant Extension program consists of seven advisors and two campus-based specialists, located from Eureka to San Diego. The USC Sea Grant Program outreach consists of a Marine Advisory Service Leader located in Southern California. These eight advisors and two specialists assist resource managers with the implementation of new practices and technologies in shoreline management, polluted runoff, fisheries, seafood technology, marine protected areas, oil and gas development, aquaculture, marine education, non-indigenous species, and other marine related disciplines. Among numerous other collaborations, the Sea Grant advisors directly helped the Resources Agency organize and summarize the valuable information gained at the international conference, *California and the World Ocean '97*.

### **National Marine Sanctuary Program**

Administered by the National Oceanic and Atmospheric Administration (NOAA), there are currently thirteen national marine sanctuaries throughout U.S. waters with the goal of protecting and studying the unique habitats contained within each region. According to NOAA, its sanctuaries help monitor both human and natural changes in the environment that can help prevent further harmful impacts. The sanctuaries link coastal communities together enabling marine advocates on both oceans to learn better ways to preserve our marine environments. There are four national marine sanctuaries off the California coast including:

- Channel Islands National Marine Sanctuary
- Cordell Bank National Marine Sanctuary
- Gulf of the Farallones National Marine Sanctuary
- Monterey Bay National Marine Sanctuary

California takes an active role in the overall management of the sanctuaries through membership on the sanctuary advisory councils. Each sanctuary has a research panel that reports to the sanctuary advisory council. For example, the research panel for the Monterey Bay National Marine Sanctuary consists of representatives from 20 research institutions as well as the Department of Fish and Game and California Coastal Commission. The panel members meet on a regular basis to discuss collaborative research opportunities and to

address specific scientific questions posed by the sanctuary advisory council that directly relate to the sanctuary's management.

The national marine sanctuaries fund researchers at outside institutions as well as having their own internal research programs. One of the largest collaborative projects to date is the Monterey's Sanctuary Integrated Monitoring Network (SIMoN program). With \$4 million in funding, SIMoN seeks to assess the ongoing monitoring being conducted by institutions in the Monterey Bay area, integrate this data into one easily assessable format, and determine which areas require new monitoring programs. The end goal of this coordination is to supply habitat, water quality and species data to the scientific community, coastal managers, industry, and the public.

### **National Estuarine Research Reserve Program**

Established by the Coastal Zone Management Act of 1972, the National Estuarine Research Reserve (NERR) Program encompasses 25 different biogeographic regions of the United States. Two such research reserves exist in California –Tijuana River and Elkhorn Slough – while a third is being created in San Francisco Bay. Funding for the reserves is provided by a partnership between NOAA and the State of California.

The Tijuana River NERR is primarily managed by the California Department of Parks and Recreation, but also receives support and input from several national, state and local organizations such as the U.S. Fish and Wildlife Service, Tijuana Slough National Wildlife Refuge, California Coastal Conservancy, Southwest Interpretive Association, San Diego County Department of Parks and Recreation and City of San Diego. A research coordinator oversees staff scientists, researchers on contract from San Diego State University, and graduate research fellows who are students from several local institutions. A coastal training program coordinator will provide current research results from the reserve to decision makers on topics such as water quality and invasive species. In addition, this person will coordinate international activities with Mexican officials and organizations, since a large part of the watershed exists across the U.S.-Mexico border.

The Elkhorn Slough NERR is organized in a very similar manner; however, its primary management organization is the California Department of Fish and Game. Research currently being conducted in the reserve includes studies on tidal erosion, invertebrate invasions, marsh nutrient dynamics, and host-parasite relationships. In addition to original research, there are several monitoring programs at the Elkhorn Slough NERR that measure water quality and determine ecosystem health, all of which take advantage of volunteer assistance. The research at the reserve is closely tied with ongoing research and monitoring efforts in the Monterey Bay National Marine Sanctuary and other academic or research institutions in the general area. Much of this work is coordinated through the Research Activity Panel of the Monterey Bay National Marine Sanctuary Advisory Council.

### **National Estuary Program**

The National Estuary Program (NEP) was established in 1987 by amendments to the Clean Water Act to identify, restore, and protect nationally significant estuaries of the United States.

Unlike traditional regulatory approaches to environmental protection, NEP targets a broad range of issues and engages local communities in the process. The program focuses not just on improving water quality in an estuary, but on maintaining the integrity of the whole system -- its chemical, physical, and biological properties, as well as its economic, recreational, and aesthetic values.

The National Estuary Program is designed to encourage local communities to take responsibility for managing their own estuaries. Each NEP is made up of representatives from federal, state and local government agencies responsible for managing the estuary's resources, as well as members of the community -- citizens, business leaders, educators, and researchers. These stakeholders work together to identify problems in the estuary, develop specific actions to address those problems, and create and implement a formal management plan to restore and protect the estuary. The program focuses attention on management concerns that effect estuaries throughout the United States, such as nutrient overloading, pathogens, toxic chemicals, habitat loss and degradation, introduced species, alteration of natural flow regimes, and declines in fish and wildlife populations. Since these are management problems that are faced nationwide, much emphasis is placed on the flow of knowledge between the programs and to coastal watershed managers.

There are three national estuaries in California. These three programs are designed slightly differently, but all collaborate closely with city, state and federal agencies in their area. In addition, they fund scientists from nearby research institutions to conduct research in and near the estuaries.

*Santa Monica Bay Restoration Project (SMBRP).* This organization, housed within the State Water Resources Control Board, has completed numerous research projects that have been directly associated with management changes. One such project was on the effects of pollution on swimmers' health (*Epidemiology Study for Santa Monica Bay*). Results from this study have led to beach water quality advisories statewide. The SMBRP continues to focus research in the areas of stormwater runoff, mapping and kelp habitat restoration, and seeks to use this information to help inform regulatory and permit procedures.

*Morro Bay National Estuary Program (MBNEP).* In addition to its status as a National Estuary, Morro Bay has also been designated a State Estuary. The MBNEP recently published the Morro Bay Comprehensive Conservation and Management Plan, which has received approval from both the governor and USEPA. This plan addresses seven priority problems causing harmful impacts to the estuary and outlines research priorities for the program scientists. This document helps coordinate and set priorities for research throughout the region.

*San Francisco Estuary Project (SFEP).* The San Francisco Estuary Project is overseen by USEPA and the State Water Resources Control Board, but is staffed by members of the Association of Bay Area Governments. The Comprehensive Conservation and Management Plan was approved in 1993, and the research priorities within this document have since been updated every two years by holding a State of the Estuary Conference. The data resulting from this conference is then used to update the research

priorities. A large part of the research and monitoring that goes on in the San Francisco estuary is undertaken by the San Francisco Estuary Institute, a non-profit sister organization.

### **Marine Protected Areas Science Institute**

Established by NOAA in 2000 under Presidential Executive Order 13158, the National Marine Protected Areas Center (MPA Center) is an innovative federal partnership with the Department of the Interior and other partners, designed to coordinate implementation of the executive order by developing a framework for a national system of MPAs and identifying the information, technologies, and strategies to support the system. As part of the MPA Center, the MPA Science Institute collaboratively supports the design and effective management of the nation's marine protected areas by developing partnerships to fulfill key scientific, technical and policy assessment needs.

To this end, the MPA Science Institute has built an international network of agency and non-governmental partner organizations that bring a wide range of natural and social science expertise to bear on these complex conservation issues. Co-located with the NOAA Fisheries Laboratory at the University of California at Santa Cruz, the MPA Science Institute has identified three project priorities: science based decision-making, improving the effectiveness of existing or planned MPAs, and improving stakeholder engagement.

The MPA Science Institute collaborates on a regular basis with the Pacific Coast Fisheries Management Council, the Pacific Coast Federation of Fishermen's Associations and the California Department of Fish and Game. The institute has provided funding to the California Marine Life Protect Act Master Plan Team and has been involved in the marine reserve evaluation process for the Channel Islands National Marine Sanctuary. The institute's own research has focused on phasing approaches to establish MPAs and working with fishermen to identifying potential MPAs. In addition, the institute is working to provide data in a web-based "Pacific MPA information clearinghouse" and is providing a user's guide to MPA types and terms that will help to increase communication between stakeholders.

### **National Marine Fisheries Service**

The National Marine Fisheries Service (NMFS) mission includes three goals: to rebuild and maintain sustainable fisheries, to promote the recovery of protected species, and to protect and maintain the health of coastal marine habitats. In order to reach these goals, NMFS supports fisheries science centers, field stations and laboratories throughout the U.S. that examine the scientific questions behind sustainable fisheries management. There are three such establishments in California including the Southwest Fisheries Science Center in La Jolla, the Santa Cruz Laboratory, and the Pacific Fisheries Environmental Laboratory in Pacific Grove.

The La Jolla Laboratory is the Southwest Regional office headquarters and the main office for the Southwest Fisheries Science Center, which oversees research that is conducted throughout the Pacific region on fish, marine mammals, sea turtles, and marine habitats.

The Santa Cruz Laboratory located in central California is a state-of-the art facility for Pacific salmon and groundfish research and home of the new National Science Center for Marine Protected Areas. The Pacific Fisheries Environmental Laboratory emphasizes the study of environmental influences on marine resources and provides environmental information to fishery researchers and managers. Researchers at all these locations collaborate with scientists at nearby institutions such as the Naval Postgraduate School, California Department of Fish and Game, and Scripps Institution of Oceanography.

## **U.S. Geological Survey**

The U.S. Geological Survey (USGS) has an active coastal and marine geology research program which has targeted four themes of national importance: environmental quality and preservation, natural hazards and public safety, natural resources, and information and technology.

To address environmental quality and preservation, USGS has identified the goals of working to anticipate the environmental impacts of climate variability, establishing the geologic framework for ecosystem structure and function, interpreting the links between human health and geologic processes, and determining the geologic controls on ground-water resources and hazardous waste isolation. Related to natural hazards and public safety, USGS has identified the goals of conducting geologic hazard assessments for mitigation planning, and providing short-term prediction of geologic disasters and rapidly characterizing their effects.

Related to natural resources, USGS has identified the goals of advancing the understanding of the nation's energy and mineral resources in a global geologic, economic, and environmental context. In addition, USGS is seeking to determine the geologic controls on ground-water resources and hazardous waste isolation, including efforts to address water resources in coastal aquifers; offshore sand for beach nourishment; minerals such as manganese phosphates and cobalt; and the geologic framework of energy resources, including potential offshore resources such as methane gas hydrate. And, related to information and technology, USGS has identified the goals of greatly enhance the public's ability to locate, access, and use maps and data, and to effectively transfer the knowledge acquired through science activities.

USGS is involved in a wide range of efforts to conduct and distribute products regarding research, monitoring, and technology developments affecting California's coastal and ocean resources.

## **IV. ACADEMIC INSTITUTIONS**

### **California Sea Grant Program**

The California Sea Grant Program is described in Section II, but is referenced here because the state and federal funds for the program are dedicated almost entirely to funding research conducted at California academic institutions.

## **University of California**

The University of California (UC) Marine Council, organized by the UC Office of the President, was established to provide leadership and direction to the University to perform a major role in the coordination of marine policy, research, education and public service and the exercise of the responsible stewardship of the state's marine resources. The UC Marine Council has published a directory of all marine scientists within the University of California including their research interests, and contact information. The council has a strong outreach component that provides scientific data to California legislators and ocean and coastal resource managers.

In 2000, the UC Marine Council initiated the California Coastal Environmental Quality Initiative (CEQI). This grant program, funded by the state at \$1.5 million annually, was created to scientifically address three management issues identified by the Resources Agency Sea Grant Advisory Panel: coastal water and sediment quality, fisheries and marine ecosystems, and coastal hazards and shoreline processes. CEQI has an established set of research priorities that will not only address interesting scientific questions, but also will provide useful information to public policy makers so that they may make informed decisions about coastal and ocean issues. Representatives from the Resources Agency and California Environmental Protection Agency, as well as UC faculty, review all proposed CEQI grant proposals. There are currently about 15 projects that are funded by this program. This year's focus was on funding projects that combined efforts between UC campuses and included several primary investigators so that large-scale, long-term projects effecting statewide management issues could be addressed.

Different UC campuses also house multi-campus research units or organized marine research units, including the Bodega Marine Laboratory (managed by UC Davis), Institute of Marine Sciences at UC Santa Cruz, UC Santa Barbara's Marine Science Institute and UC San Diego's Scripps Institution of Oceanography. These units serve to a degree to coordinate research among faculty and students at their respective institutions.

## **California State University System**

There is currently no specific council or other system-wide coordinating mechanism established for the California State University (CSU) System to coordinate marine research activities among campuses, though efforts to create one are underway. In many cases, individual campuses have research programs, units or laboratories through which researchers and graduate students coordinate their activities. CSU campuses do participate in regional research and coordination efforts, such as the Monterey Bay Crescent Ocean Research Consortium, Moss Landing Marine Laboratories and Southern California Marine Institute. Campus researchers also coordinate to a degree through organizations such as the California Sea Grant programs and other national research organizations. This should be further explored in a subsequent analysis of the coordination of the substantial research conducted at these facilities.

## **Private Institution Research**

Similar to the CSU System, there is no statewide mechanism established for private institutions for the overall coordination of their marine research activities. In many cases, individual campuses have research programs, units or laboratories through which researchers and graduate students coordinate their activities, such as Hopkins Marine Station of Stanford University and the University of San Diego.

## **Joint State-University Appointments and Co-located Facilities**

There are a few joint state-UC appointees who facilitate the flow of ideas from the university to state agencies and the flow of funding from the state to projects related to ocean and coastal resource management. There is one such appointment, sponsored by the Department of Boating and Waterways, at Scripps Institution of Oceanography. The appointee serves as the program manager for the Coastal Data Information Program (CDIP) which measures, analyzes, archives, and disseminates coastal environment data for use by coastal engineers, planners, and managers as well as scientists and mariners.

Another model is the mix of co-located facilities and joint appointments. Currently DFG's Office of Spill Prevention and Response has a Marine Wildlife Center located at the UC Santa Cruz Long Marine Laboratory. This center is also affiliated with the Wildlife Care Network, centered at UC Davis where another state employee is working in a joint state/UC appointment.

The use of these types of liaison positions and co-locating facilities should be evaluated as a potential model for use with other collaborative initiatives between the State of California and academic institutions.

## **UCLA Workshop on Developing a Marine Postgraduate Degree Program**

With the goal of exploring the program elements necessary for establishing a postgraduate program to train the next generation of coastal zone managers, UC Los Angeles, California Sea Grant, the Resources Agency and NOAA co-sponsored a Postgraduate Degree Program Workshop in September 2001. Fifty-two representatives from federal and state agencies, private businesses, non-profit organizations and academia were in attendance. The main result of this workshop was the recognition that there is a need to form such a program in California. The relevance of the workshop to this report is the clearly identified need for marine policy and science postgraduate programs to emphasize the linkage (and need for coordination) between science and management.

## **National Center for Ecological Analysis and Synthesis**

The National Center for Ecological Analysis and Synthesis (NCEAS) facilitates integrative research aimed at synthesizing existing data and information, and subsequently making these data available through the internet and/or journals. Funding for the center comes from the National Science Foundation, the State of California, and UC Santa Barbara. All research is reviewed by the NCEAS Science Advisory Board, which is made up of

representative universities and other invited participants. Its activities focus extensively on marine issues, including several ongoing projects regarding relevant topics such as marine infectious diseases, tools for the practical design of marine reserves and integrating marine ecology data for scientific analysis and resource management. A key role of NCEAS is the synthesis of technical data and information for use by ocean and coastal managers and policy makers.

## **V. REGIONAL PROJECTS AND ORGANIZATIONS**

### **Southern California Coastal Water Research Project**

The Southern California Coastal Water Research Project (SCCWRP) Authority is a joint powers agency that provides research data to their member agencies so that they may effectively, and cost-efficiently, protect the Southern California marine environment. SCCWRP is governed by a nine member commission that includes representatives of city, county, state, and federal government agencies responsible for monitoring and protecting the marine environment. Internal advisory groups also have representatives from multiple agencies.

SCCWRP was originally established to determine the effects of wastewater and other discharges to the coastal marine environment; however the scope of the research priorities has grown over the years to include analytical chemistry, benthic ecology, fish biology, toxicology and new monitoring technologies. Another main focus of SCCWRP is to increase the exchange of data between scientists, policy makers and the public. All of the data is public and is often published in peer reviewed journals. As an additional mechanism for data exchange, scientists from SCCWRP take part in other regional organizations such as the Southern California Wetland Recovery Project's Science Advisory Panel, the Los Angeles Regional Contaminated Sediments Task Force and the Southern California Stormwater Monitoring Coalition.

### **Southern California Wetlands Recovery Project**

The Southern California Wetlands Recovery Project (SCWRP) is a partnership of state and federal agencies working in concert with local governments, environmental organizations, and the business community to develop and implement a regional strategy for the preservation, restoration, and enhancement of coastal wetlands and coastal watersheds. SCWRP's primary goal is to re-establish a system of wetlands that mimic natural conditions as much as possible. To reach this goal, many separate entities are working together to base restoration efforts on scientifically sound data and information.

The SCWRP board of governors contains members from national and state agencies. Recent projects sponsored or organized by SCWRP include the San Elijo Lagoon Health Monitoring and the Tijuana Estuary Model Marsh. A Science Advisory Panel has been established to help ensure that the best available science is incorporated into the decision-making processes of the SCWRP, and to advise the board on regional goals, objectives, project criteria, and priorities. This panel is a good example of a regional science

coordination mechanism that will help guide the implementation of coastal management objectives in Southern California.

Recently the Secretary for Resources and the Region IX Administrator for the U.S. Environmental Protection Agency spearheaded an effort to create a San Francisco Bay Wetlands Restoration Program. This effort will also include the services of a Science Advisory Group (monitoring and restoration design review functions), which will be helpful in efforts to coordinate wetland restoration science within California's largest estuary.

### **California Cooperative Oceanic Fisheries Investigations**

In 1949, in order to understand the decline in sardine populations off California, researchers from Scripps Institution of Oceanography, the California Academy of Science, the Stanford Hopkins Marine Station at Monterey, the NOAA/NMFS Southwest Fisheries Science Center, and the California Department of Fish and Game created the California Cooperative Oceanic Fisheries Investigations (CalCOFI). The CalCOFI time-series monitors the physics, chemistry, biology, and meteorology of the California Current ecosystem.

In addition to providing a foundation of data for researchers to build upon, the program has assembled the largest zooplankton collection in the world, providing information for fisheries management and helping scientists understand large-scale environmental change. Celebrating over fifty years of continuous operation, CalCOFI boasts a history encompassing hundreds of thousands of ocean measurements and net tows taken during 300 cruises. CalCOFI hydrographic and plankton data are distributed to the community for use without restriction. The organization holds an annual meeting to discuss and coordinate research findings with other researchers, industry, and ocean and coastal resource managers.

### **Monterey Bay Crescent Ocean Research Consortium**

The president of the Monterey Bay Area Research Institute (MBARI), chairs the Monterey Bay Crescent Ocean Research Consortium (MBCORC), which was started four years ago by MBARI, the Monterey Bay Aquarium and UC Santa Cruz. It was formed to provide a framework and mechanism for cooperation and collaborative activities of mutual interest in education, research and operational ocean-related activities, and is a major influence for research organizations in the Monterey area. There are 24 members of MBCORC, including 10 academic institutions, Monterey Bay Aquarium, and a number of state and federal agencies. MBCORC plays an important role in facilitating regional coordination of research and monitoring activities in the Monterey Bay area.

### **San Francisco Estuary Institute**

San Francisco Estuary Institute (SFEI), a nonprofit organization, acts as the science arm of the San Francisco Estuary Project. SFEI addresses the research priorities established by the Estuary Project and follows the direction of a management board, which is made up of members from national and state agencies, local dischargers, and environmental groups. Research at SFEI is divided into five general categories, including the contaminant monitoring and research program, the regional monitoring program, the wetlands science

program, the watersheds science program, and the biological invasion program. Funding for almost all the research is provided by outside grants; however, money for the regional monitoring program is provided by discharger fees.

For the last several years scientists within the wetlands science program have released a report called the Bay Area Wetlands Ecosystem Goals. The Goals are a vision of the types, amounts, and distribution of wetlands and related habitats needed to sustain diverse and healthy communities of fish and wildlife in the San Francisco Bay Area. They are intended to provide a biological basis to guide public and private efforts seeking to preserve, enhance, and restore the integrity of the baylands ecosystem. In addition, the Institute has a series of maps of the bay and the types of habitat that are available to the general public and law-markers. Almost all of the research conducted at SFEI is in conjunction with local universities such as San Francisco State University, UC Davis and UC Berkeley.

## **VI. PRIVATE AND PUBLIC SERVICE ORGANIZATIONS**

Private and public service organizations and institutions fill a critical niche through statewide monitoring efforts and in providing data for projects that would be difficult to fund through national competitive grants. It is beyond the scope of this report to try to identify these organizations and institutions in a comprehensive fashion. These can be operated by private sector interests, wildlife rehabilitation organizations, or sometimes through the efforts of public service or non-profit organizations. This is an area where subsequent analysis should be conducted to obtain a more detailed accounting of the many organizations and institutions that are coordinating research or monitoring along the California coast. This information will be necessary before a truly comprehensive picture of California research and monitoring activities and their improved coordination can be developed.